the new Houses of Parliament. Having maturely considered the subject, I think it would be practicable to obtain a public road of ample width upon arches, from the termini of the South-Eastern and Dover and Brighton Railroads, at the foot of London-bridge to the terminus of the South-Western Railway at Vauxhall.

"The road might be raised upon arches to a level that would coincide with the levels of the roadway of the several bridges which it would intersect, by which means the water-side frontages of the several wharfs need not be interfered with in any material degree; indeed, the extent of such frontages might, by the means of docks of convenient form and size, be very considerably increased, and the archways might, to a great extent, be appropriated, if desired, to warehouses and other purposes of trade. By extending the archways to a sufficient depth to the south of this road, a frontage for building might also be obtained, particularly opposite Privy Gardens and the new Houses of Parliament, where, if the houses were designed in masses, with reference to architectural effect, they would form an agreeable and striking view from the north side of the river, and effectually screen the present low and mean display of unpicturesque buildings on the Surrey side. The proposed houses, from being raised to a considerable elevation would have a fine command of the river, and the principal public buildings of the metropolis, and having, in addition to these advantages, a southern aspect, would form very agreeable residences, such as would probably be eagerly sought for by the owners of adjoining wharfs, either for their own occupation, or that of their principal agents. Taking into consideration the private accommodation to the several wharfs, and the value of the new building frontage, the proposed work would probably yield a very considerable return for the capital expended upon it, and, when effected, would not only form one of the most striking improvements of an ornamental character of which the metropolis is susceptible, but would materially conduce to the convenience, the comfort, and the recreation of the public. It would also, perhaps, render unnecessary the line of road that has been projected from the termini of the railroads at the foot of London-bridge, through Southwark to the foot of Westminster-bridge, for the convenience of the west end of the town, as the distance to that part of London would be materially shortened by taking the proposed embankment road, and passing over Waterloo-bridge."

Of the local improvements immediately contiguous to the new Houses of Parliament and the approaches, Mr. Barry in continuation remarks:—

"Old Palace-yard is proposed to be considerably increased in size by the demolition of the houses which now occupy that site, as well as the houses on both sides of Abingdon-street, by which means a fine area for the convenience of state processions, and the carriages of peers and others attending the House of Lords, as well as a spacious landing-place adjoining the river, would be obtained. The Victoria Tower, as well as the south and west fronts of the building, would thus be displayed to the best advantage. The Chapter House would be laid open to public view, and if restored, would form a striking feature in conjunction with the Abbey; and a considerable extent of new building frontage that would be obtained by this alteration might be occupied by houses of importance, in a style of architecture in harmony with the Abbey and the new Houses of Parliament, by which a grand and imposing effect as a whole would be produced. As one means of improving the approaches I propose that the noble width of street at Whitehall should be extended southwards by the removal of the houses between Parliament-street and King-street, by which the Abbey would be wholly exposed to view as far as Whitehall Chapel. The houses on the north side of King-street should be removed for the purpose of substituting houses or public buildings—if required, of an improving style of architecture.

"Millbank-street is proposed to be widened and improved, in order to make it a convenient and effective approach from Millbank-road to the Victoria Tower and Old Palace Yard. Tothill-street is also proposed to be widened and improved, in order that it may be made an equally convenient and striking approach to the Abbey, the Houses of Parliament, and Whitehall from the west-end of the town. St. Margaret's Church, if suffered to remain in its present position, should be improved in its external decoration, in order that it may not disgrace, as it now does, the noble pile of the Abbey, which rises above it."

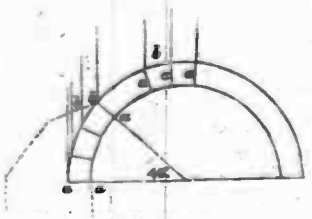
Mr. Barry concludes the enumeration of all the principal improvements he judges to prove most effective to the building on which he is engaged, by the hope, although some might be considered impracticable, that at no distant period the rebuilding of the superstructure, the embankments of the river, the enclosure of New Palace Yard, and the enlargement of Old Palace Yard, may be accomplished as "improvements of the utmost importance, whether as regards the beauty of the metropolis, the effect of the new Houses of Parliament, or the convenience, as well as the enjoyment of the public."

ON THE STRENGTH OF ARCHES.

TO THE EDITOR OF THE BUILDER.

SIR,—Having seen in your number for the 8th of this month some pertinent remarks on the strength of arches, will you permit me to offer you a few observations on the same subject.

In all arches whose intrados, or soffit, rides at right angles with their springing line, as semicircular, semielliptic, and other similar arches, each voussoir, or archstone, being considered as a wedge, impelled inwards by the superincumbent weight, we see that at the crown of the arch the voussoirs receive the full effect of the weight, whilst on the haunches of the arch not only does this weight act more and more obliquely as we descend to the springing line on each voussoir, and so produce less effect in forcing it inwards; but when the voussoirs are of the same length and width as in the annexed figure at (*a a*) the quantity of material acting on each voussoir is reduced by the breadth (*d*) also diminishing. Now, it is evident that to make up for this deficiency in quantity and impulse, the height of material above the extrados or back of the voussoirs must constantly increase from the crown to the springing. At the lowest point (*a*), we see that the superincumbent material exerts no force to impel the voussoir inwards, acting as it does at right angles to its bed, and here, therefore, an infinite height of material is required. This is on the supposition that we equilibrate the arch by means of vertical pressure alone, without regard to any abutment behind the arch, and friction and cohesion being entirely out of the question.



In practical arches, however, friction alone will prevent the archstones sliding inwards until raised nearly forty degrees above the springing line, or from *e* to *d* on the figure. This part of a semicircular arch may, when well set, be considered as part of the abutment (indeed in arches of this description which have failed, I have noticed that the lower part of the arch generally remains attached to the abutment), and the pressure to be resisted is the pressure exerted by the crown and haunches of the arch, comprising in a semicircular arch an arc of about 100 degrees. Omitting this part of an arch saves in practice almost nothing of horizontal thrust, and we are by no means compelled to build a high mass of work above the lower voussoirs to prevent their being forced out of their places. A well-built abutment, or backing, as shewn by the dotted lines, or an arch buttress as we see in Gothic structures, is a far more secure and effectual method of resisting the pressure of the arch. By raising a mass of material above the lower voussoirs we cause the resisting force to act at a disadvantage, inasmuch as if the voussoir move at all it must move horizontally, whilst the resisting material acts vertically, or at right angles, to the direction of the voussoir's motion, and were it not for friction no weight we could raise would prevent its being forced out. How great a force, even with the aid of friction, is required to keep a body from moving when the resisting force acts merely at right angles to the direction of its motion, we may learn by a simple experiment.

Suppose *A B* to be an upright surface, as a wall, and *c* a heavy body pressed against it in the direction *D E*, we shall find a very considerable force required in proportion to the weight of *c* to keep it in its place.

The mediæval architects appear to have made use of both methods of rendering an arch secure by using buttresses, and high pinnacles as well.

A wall raised a considerable height on the abutment, will unquestionably effectually resist the pressure of an arch, as we see in the arcades at Covent Garden and elsewhere, but there is this disadvantage, that if the pier should by settlement of the arch, or bad foundation, be forced much from the perpendicular, the superincumbent mass tends only to accelerate the ruin of the whole.

Arches that have great horizontal pressure, where the abutments are well built and sufficiently strong, are much firmer or stiffer than those which have less thrust, nor are they so likely to suffer from vibration caused by heavy weights passing over them, as in bridges. Each voussoir being considered as a wedge, and the superincumbent work as a weight acting on it, we see that the more acute the angle of such wedge is the more easily will it be forced inwards. In all arches where the archstones are of the same width it is evident that the acuteness of the angle of each archstone varies as the radius of curvature, or, in other words, that the greater the radius of any arch the more acute will be the angle of each voussoir, the breadth of them being the same. We see, therefore, that in any arch, the curvature of which varies, as an elliptic, a parabolic, or a cycloidal arch, that part of the arch will be most easily forced in which has the greatest radius, and that part will bear the greatest weight where the curve is quickest. An instance of this is the parabolic arch, which will bear an enormous weight upon its crown, as is shewn in Bow Church, Cheapside, in which the spire, &c. rests upon a parabolic dome.

The equilibrium of the archstones amongst themselves, supposing the abutments perfectly firm and secure, is an important point to be attended to, and in this respect we have an advantage in using an arch whose rise is not great in comparison of its span. As I do not wish to be misunderstood, I repeat that the abutments are now considered perfectly immoveable, however great the thrust of the arch. A semicircular or semielliptic arch may fail without disturbing its abutments, especially when the archstones are not very deep. Two instances occur to me which are pretty familiar to most persons; one, however, is not a failure though approaching it, the "Pont de Neuilly," which sunk at the crown eighteen inches; and the "Pont-y-pridd," built by Edwards, the celebrated Welsh mason, in which the key-stones were forced up by the weight on the haunches. In neither case does it appear that the abutments were disturbed. The arch of Pont-y-pridd is, I believe, not quite semicircular, but a large segment. Where little horizontal pressure and material are desirable, as in vaultings, high-pointed arches are certainly excellent. I am disposed to think, notwithstanding the superior skill displayed in mediæval structures, that we overrate the adherence of their architects to scientific principles. As an instance I would point out the use of heavy pendents with comparatively flat arches, whilst such pendents are wanting in lancet arch vaulting, where they would have given as heavy key-stones the firmness resulting from pressure; the other arches being so much flatter do not certainly appear to require them. This opinion, I am aware, is in these days very heretical; but I yet think it correct.

Those four-centered arches, which you justly censure, and which gradually flattened down to the square head over doors and windows, rising with a quick curve from their springing, with haunches very nearly straight lines meeting in an obtuse point, are very unsafe, as well as, in my opinion, unsightly. In these arches, that part which has the greatest weight to carry has, most perversely, scarcely any curvature, and the pressure they exert horizontally must be enormous. I have, notwithstanding, seen them used, and I may add, the use of them attempted under heavy gables. I hope I have not tired you with my long discussion, and begging you to make use of all, or any part, if you find any part of it worth notice,

I am Sir, your obedient servant, D.

GEORGE THE FOURTH.—The effigy of George the Fourth, at King's-cross, which has for the last thirteen years offended the eye of taste, is, at last, removed; and, with the exception of the head, destroyed. It was taken down on Wednesday the 26th ult., preparatory to the erection in its stead, of a camera obscura.

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